Proposed Speed Correction Factors for MOBILE6

(M6.SPD.002)

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What are Speed Corrections for?

- Adjust for different average speeds
- Adjust for different roadway types
- Adjust for aggressive driving behavior

Roadway Types/ Facilities

- Freeways
- Arterial/Collectors
- Local Roadways
- Freeway Ramps

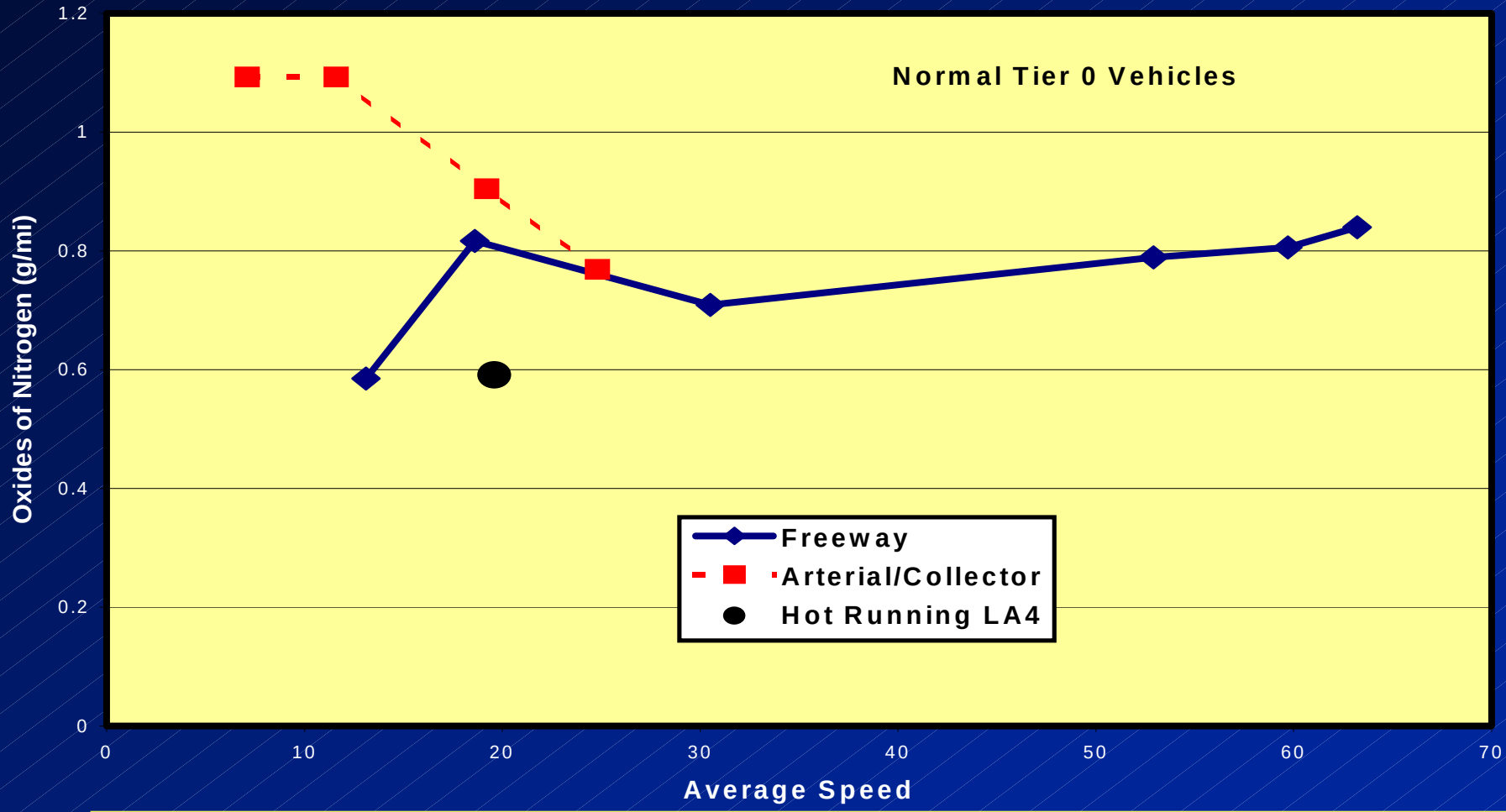
Emission Test Data

- 85 recent model year passenger cars and light trucks
- Tests include the FTP
- Test order was randomly varied

Facility Specific Driving Cycles

- Freeway (6 from 13.1 to 63.2 mph)
- Arterial/Collector (4 from 7.1 to 24.8 mph)
- New York City Cycle (NYCC)
- Freeway Ramp
- Local Roadway

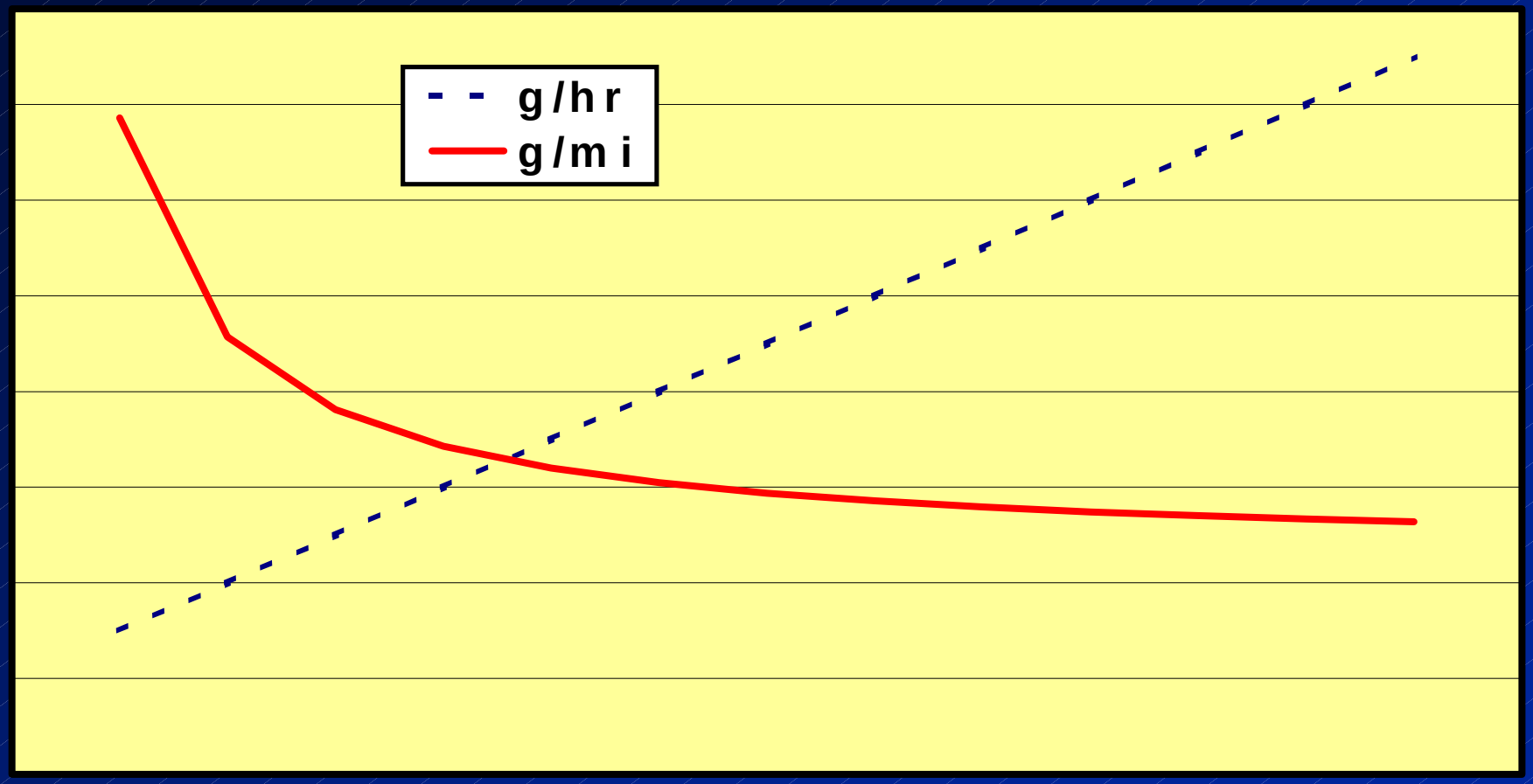
Example of Raw Data Averages



Convergence Hypothesis

- At very high speeds, freeways and arterial/collector roadways are similar.
- At very low speeds, freeways and arterial/collector roadways are similar.

Grams per Hour versus Grams per Mile



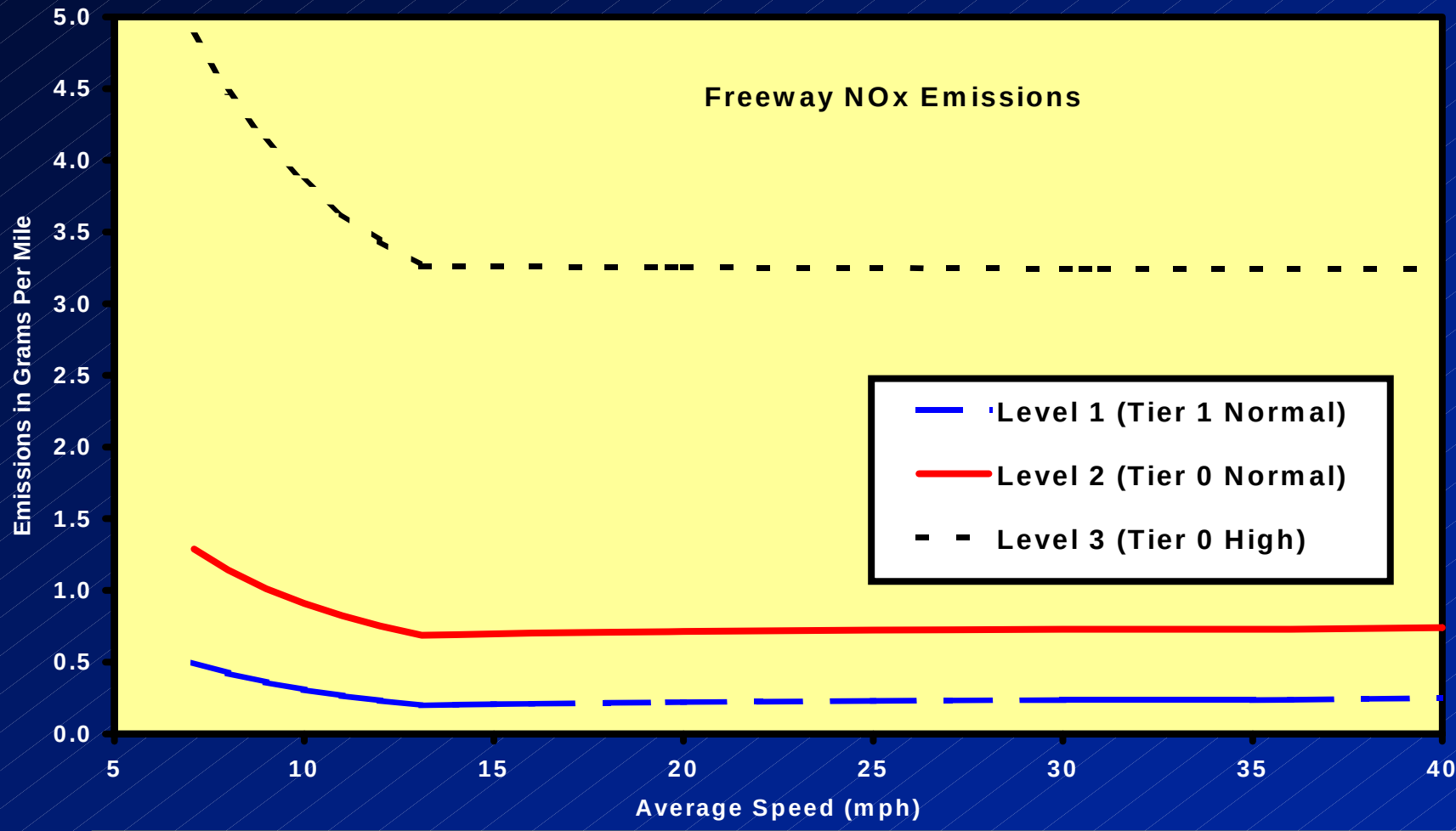
Piecewise Linear Regressions

- Low speeds use grams per hour
- High speeds use grams per mile
- Freeways <13.1 mph connect with NYCC at 7.1 mph

Subsample Analysis

- Sample split by emission standards (Tier 0 versus Tier 1)
- Tier 0 sample split by emitter level (high versus normal)
- Effective result is three emission levels

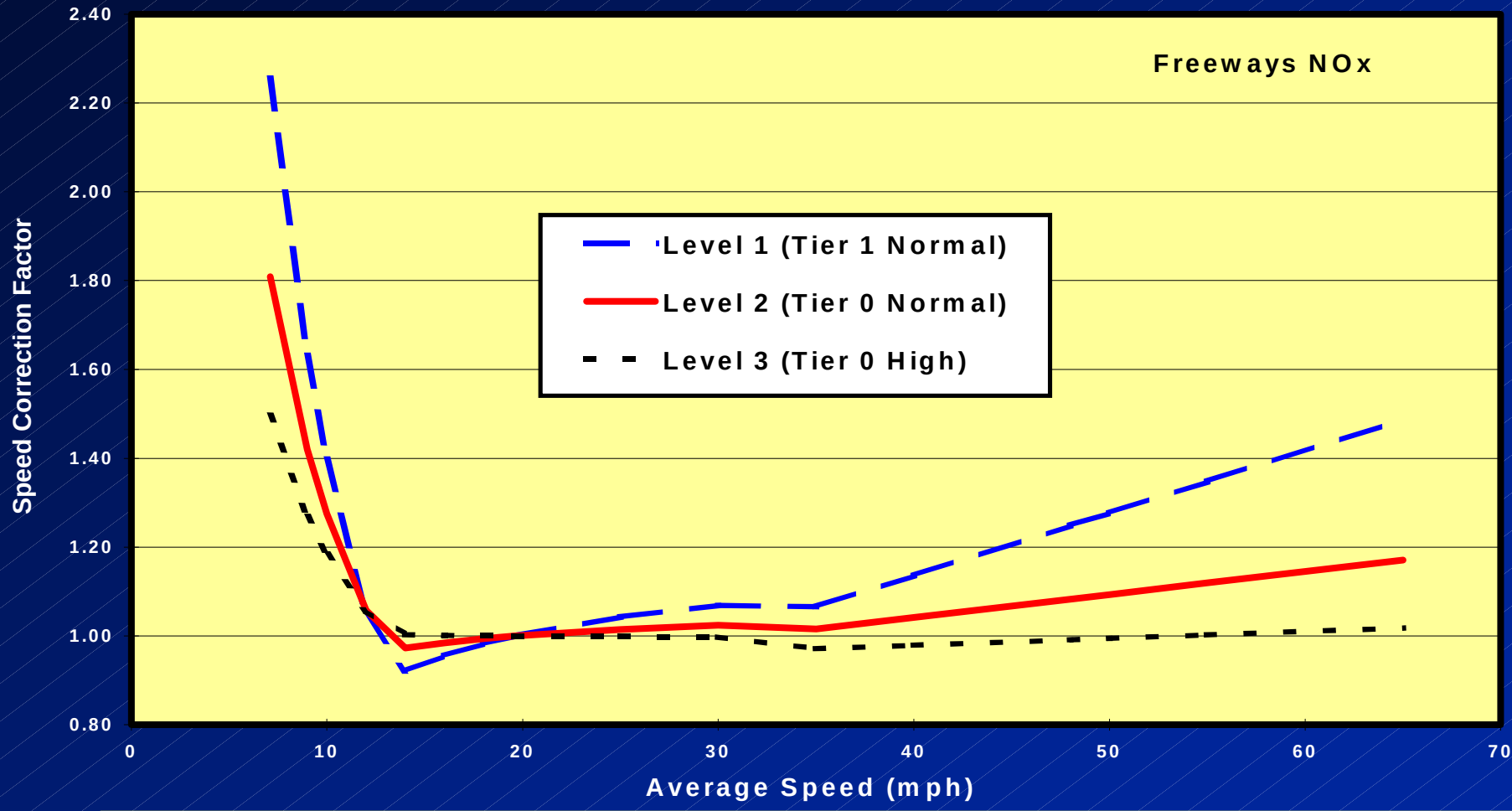
Example Effect of Speed by Emission Level



Calculation of Speed Correction Factors

$$SCF_{speed} = \frac{\text{Freeway Emissions}_{speed}}{\text{Freeway Emission}_{19.6\ mph}}$$

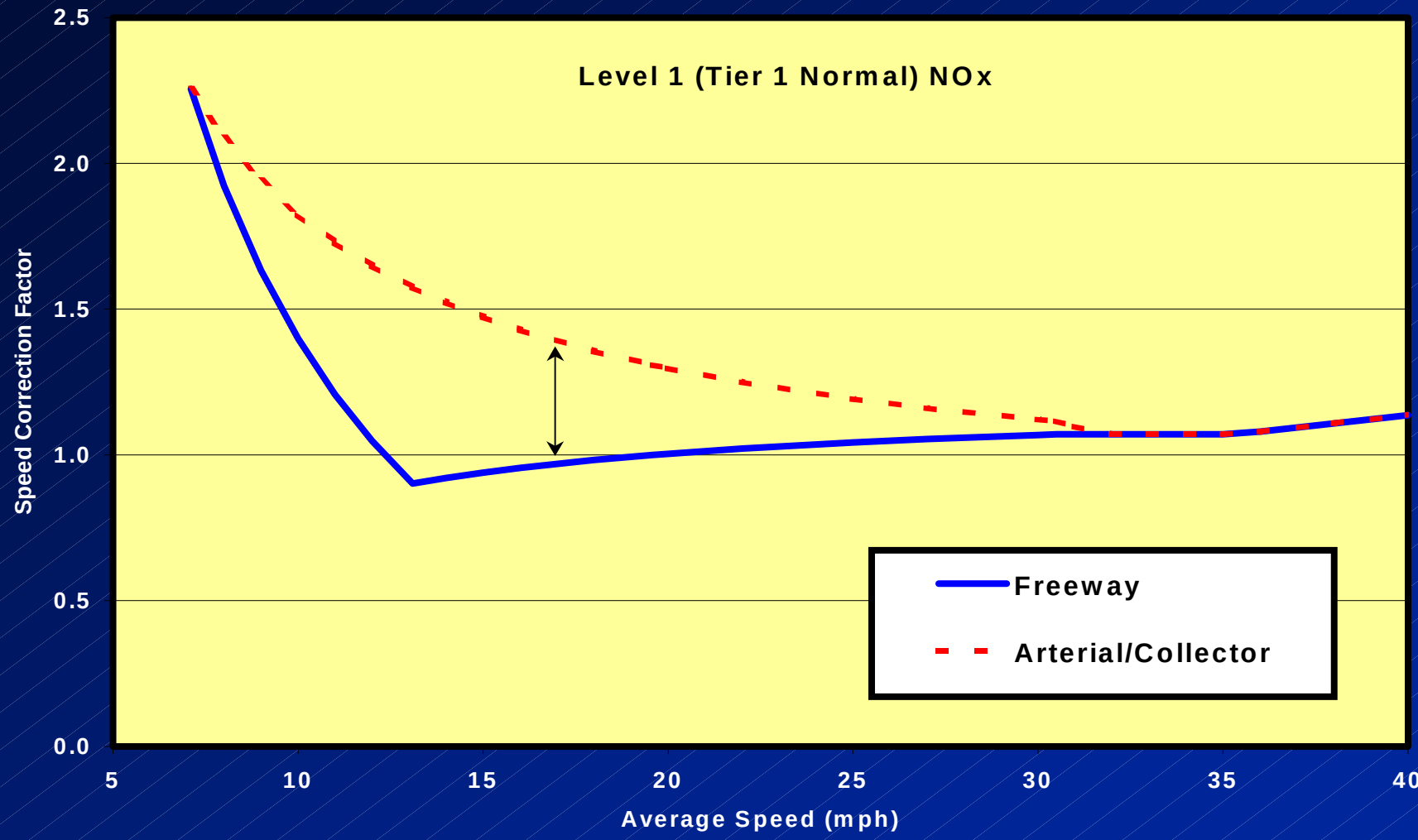
Example Speed Correction Factors



Adjustment of the Basic Emission Rate

- Calculate the basic running exhaust emission rate (19.6 mph).
- Calculate the freeway emission rate at 19.6 mph.
- Calculate the difference for each emission / technology level.

Arterial/ Collector Emissions



Summary

- We have speed correction factors for normal and high emitting Tier 0 vehicles.
- We have speed correction factors for normal Tier 1 vehicles.
- We do not have speed correction data that is facility specific or includes appropriate aggressive driving for older or newer technologies.

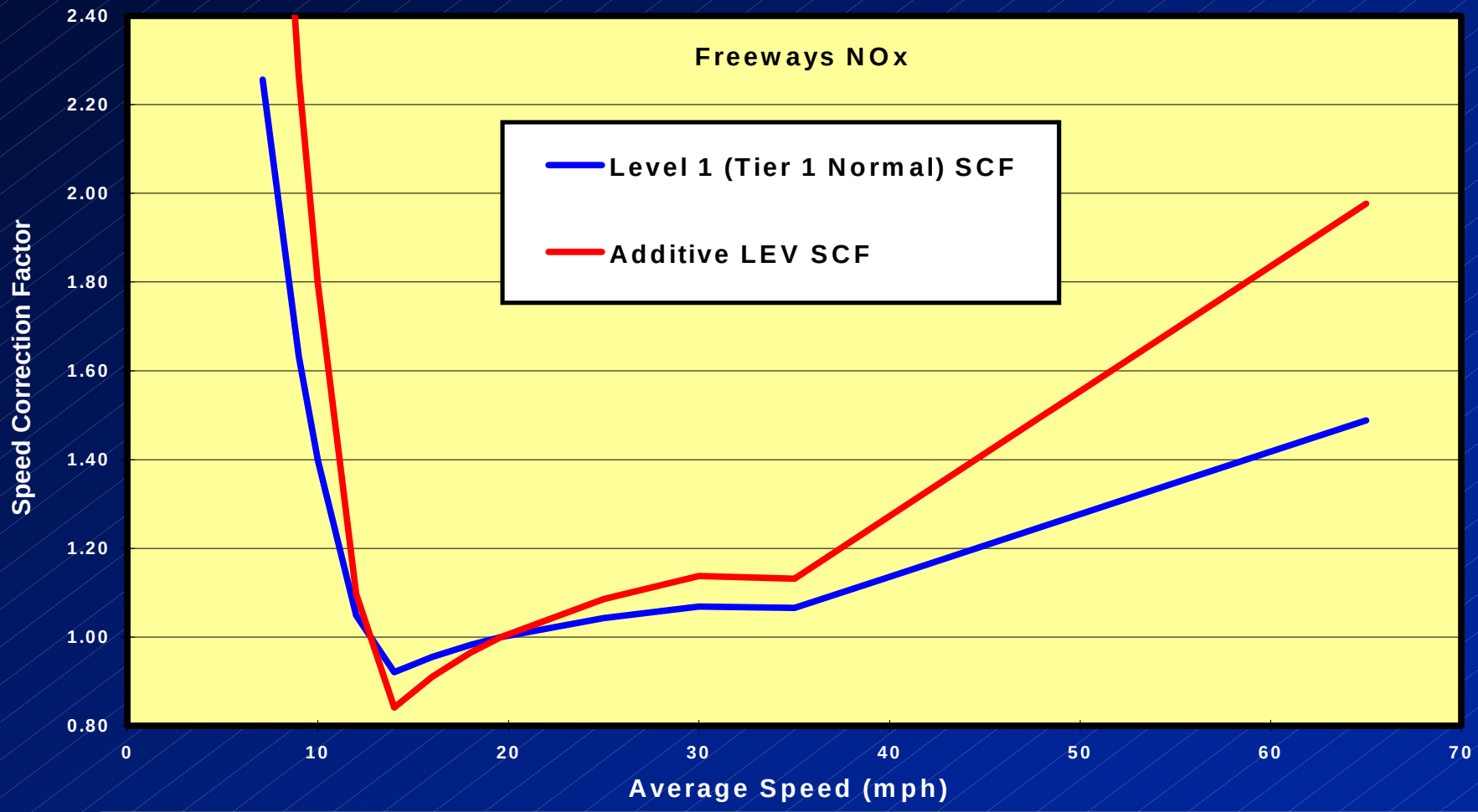
MOBILE6 Proposal

- Use Tier 0 speed correction factors for pre-1981 model year light-duty vehicles.
- Use Tier 0 speed correction factors for high emitting Tier 1 vehicles.
- Use adjusted Tier 1 speed correction factors for LEVs.

Emission Level Adjustments

- Emissions above Level 3 will use Level 3 speed corrections.
- Emissions between Level 1 and Level 3 will use interpolated speed corrections.
- Emissions less than Level 1 (Tier 1 emissions) will use adjusted speed correction factors.

LEV Speed Correction Factors



Freeway Ramps

- Single ramp driving cycle
- No speed adjustment
- Allows adjustment of ramp activity
- Correction factor is a function of emissions

Local Roadways

- Single local roadway cycle
- No speed adjustment
- Accounts specifically for local driving
- Correction factor is a function of emissions

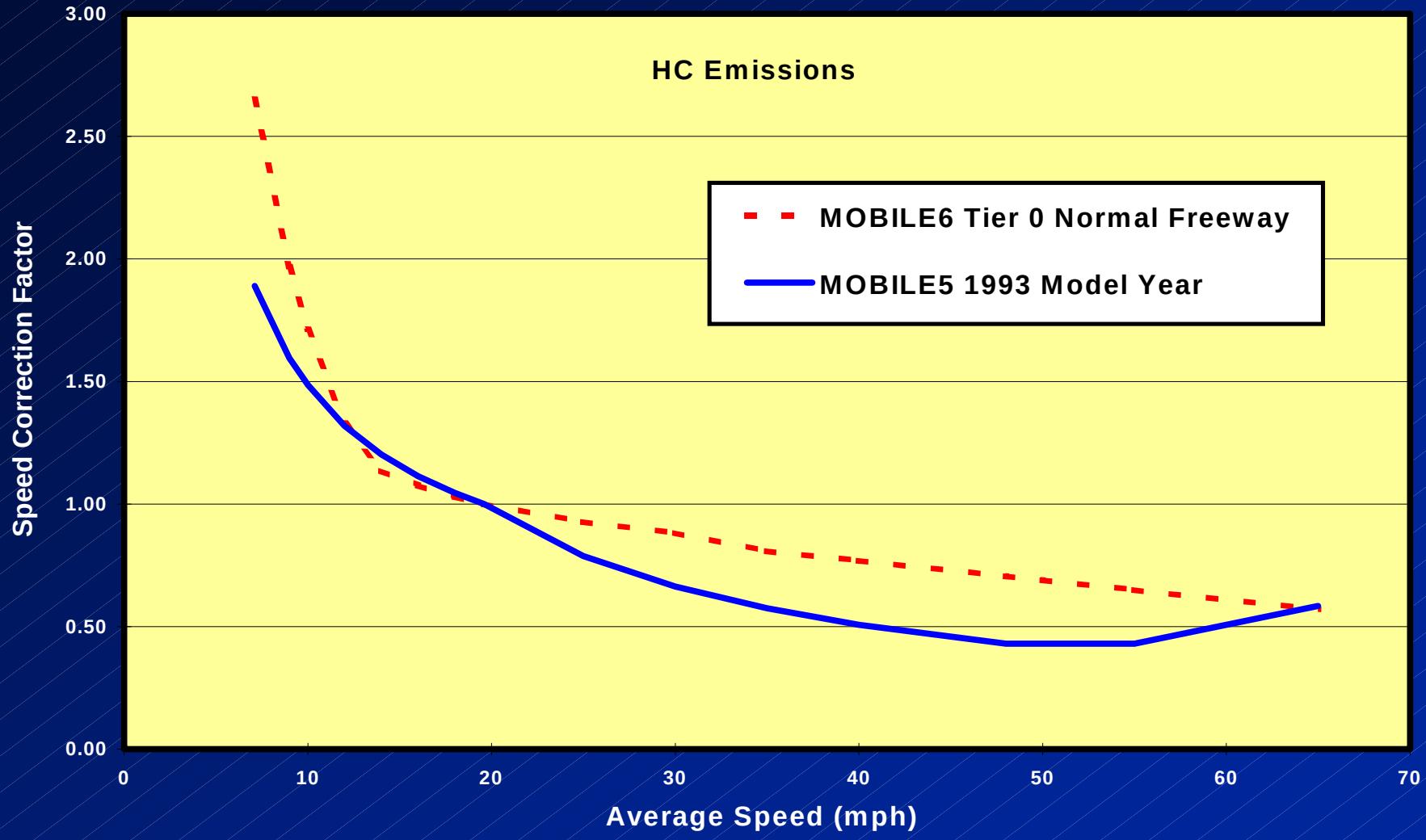
Major Differences from MOBILE5

- Based on new facility specific cycles
- Include the effects of “aggressive” driving behavior
- Vary by emission level
- Apply to all model year light-duty vehicles and trucks

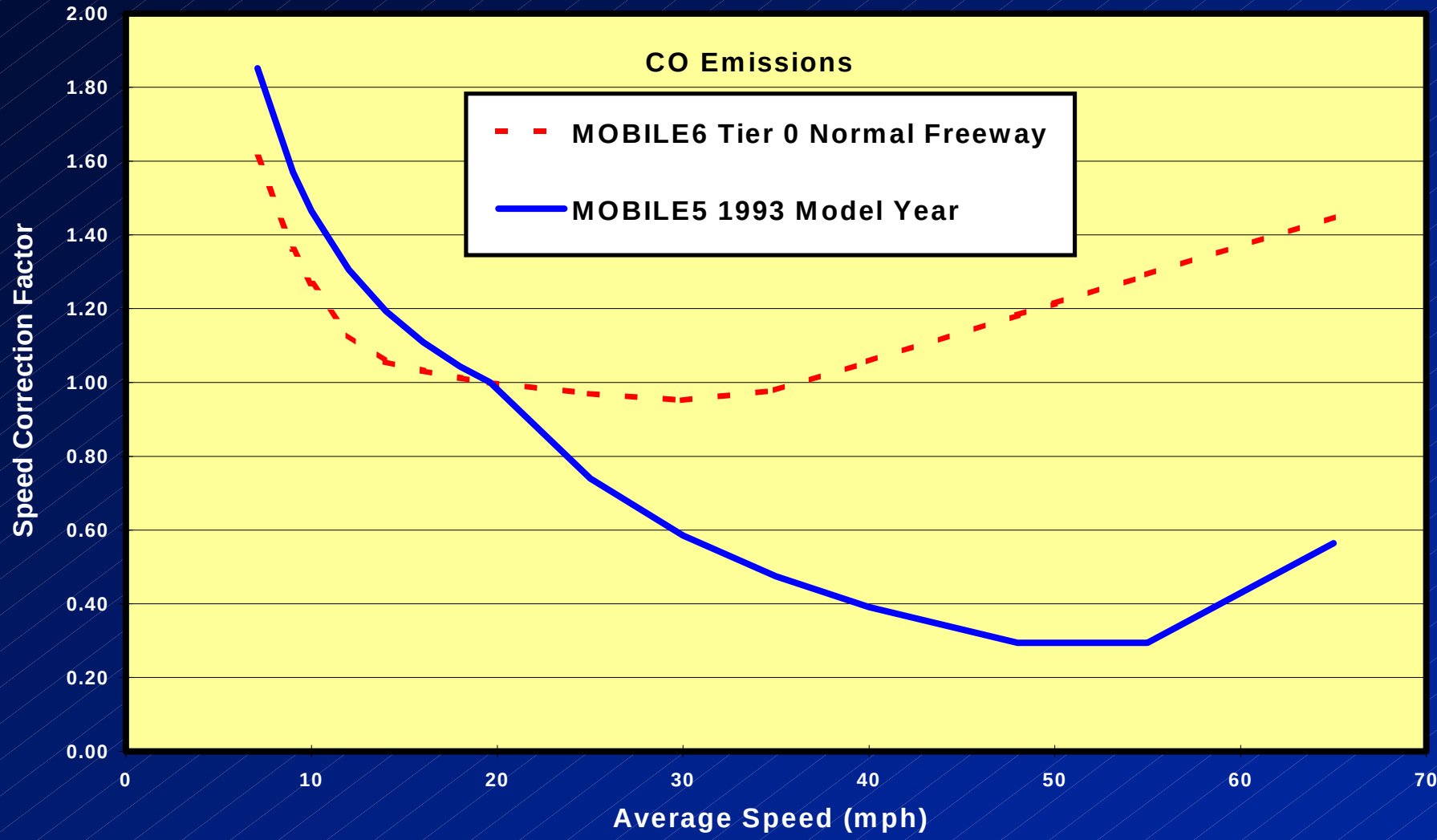
Difficulties Comparing MOBILE6 with MOBILE5

- M6 depends on emissions, M5 depends on model years
- M6 split by roadway type, M5 is combined roadways
- M6 apply to hot running emissions, M5 include starts
- M6 includes aggressive driving effects

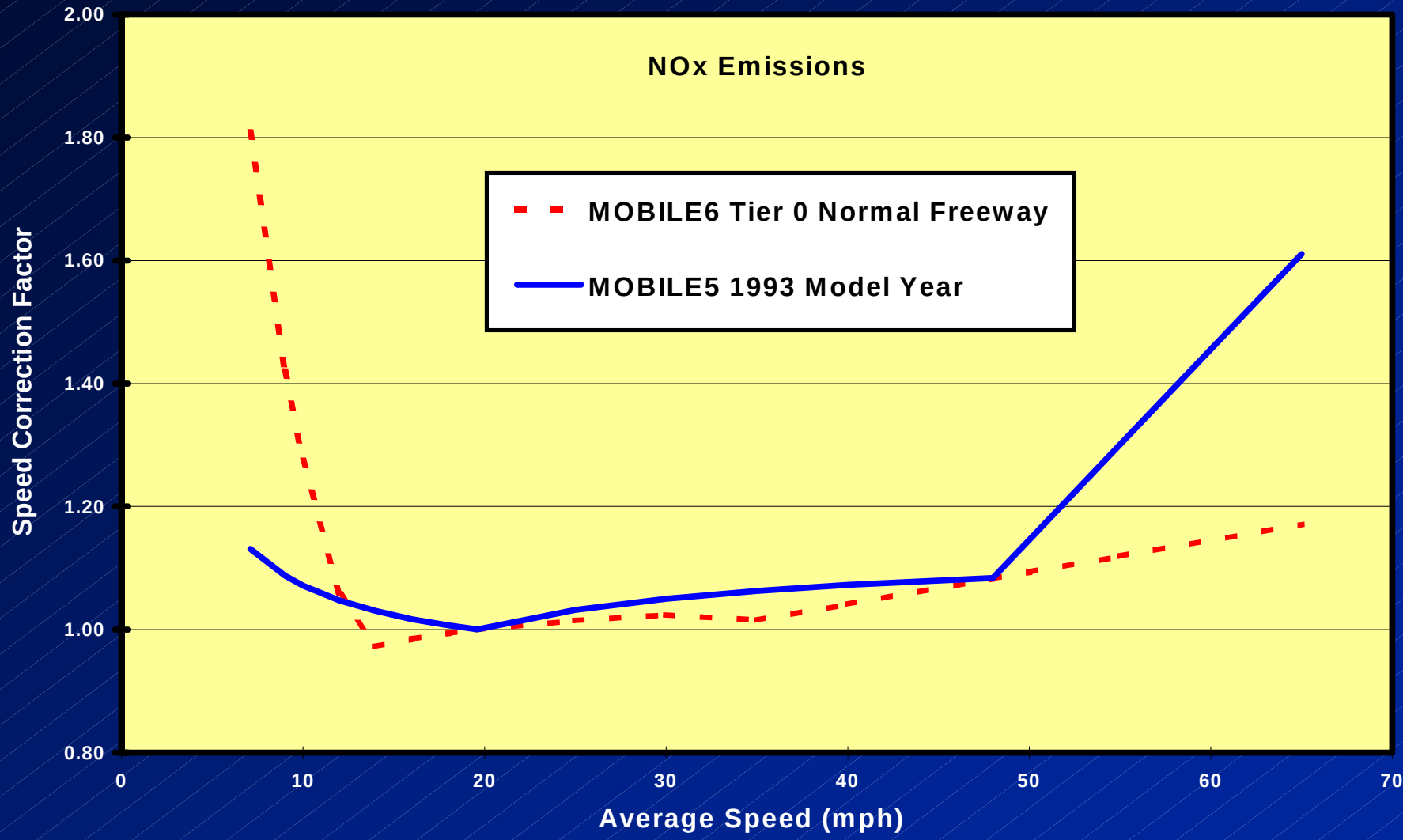
MOBILE6 versus MOBILE5



MOBILE6 versus MOBILE5



MOBILE6 versus MOBILE5



References

“Development of Speed Correction Cycles”

M6.SPD.001

“Facility Specific Speed Correction Factors”

M6.SPD.002